Polybrominated diphenyl ethers in sediment and fish samples by HRGC/HRMS

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Introduction

Polybrominated diphenyl ethers (PBDEs) are a group of brominated flame retardants. They are widely used in consumer goods like plastics, electronics, textiles and foam. This has increased their presence in the environment in recent years.
Commercial products containing PBDEs are technical mixtures of different congener compositions from 3 to 10 bromine atoms (La Guardia et al., 2006). Some of these technical products have been banned by the European Union (De Wit, 2002).
PBDEs have been detected in food, sediments, sewage sludge, biota, breast milk, human blood, adipose tissue and air (Renner, 2000).
A variety of health effects are associated to PBDEs. These chemicals may cause liver, thyroid and neurodevelopment toxicity. There is evidence about their endocrine disrupting potency.
The low brominated congeners are the forms most frequently detected in wildlife and humans because they are more bio-accumulative.
Due to their persistence and lipophilic nature, PBDEs are considered as priority pollutants included in Water Framework Directive (decision 2455/2001/EC).

Materials and Methods

The analysis of PBDEs has been performed by internal methods of our laboratory based on US EPA Draft Method 1614. Identification and quantification has been made by high resolution mass spectrometry (HRGC/HRMS). Instrumental parameters have been optimised in order to analyse the most important congeners in a simultaneous analysis.
For the quantitative isotope dilution analysis BDE labelled standards have been used which were purchased from Wellington Laboratories (Ont., Canada). Quantification of PBDEs congeners was performed using relative calibration curves. Other adopted quality assurance measure has been the participation in the Quasimeme intercalibration round in 2006.

Results and Discussion

Since 2002 the laboratory has determined PBDEs in more than 200 environmental samples.
In the present work, results of 46 fish samples and 55 sediment samples from Catalonia rivers in 2005 and 2006 are considered. The following congeners were identified: BDE-47, BDE-99, BDE-100, BDE-153, BDE-154 and BDE-209. Total PBDEs levels range was 0.2-12 ng/g wet weight for fish samples, and 0.3 -3116 ng/g dry weight for sediment samples. Recoveries obtained were above 70% for all congeners. To avoid cross-contamination methods blanks have been performed.
The results of sediment samples show a high contribution of BDE-209 congener. On the contrary the highest contribution in fish samples is related to BDE-47.

References

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